

NORTH CAROLINA

AGRICULTURAL EXPERIMENT STATION

OF THE

**COLLEGE OF AGRICULTURE AND
MECHANIC ARTS**

WEST RALEIGH

PROFITABLE POULTRY RAISING

THE NORTH CAROLINA

AGRICULTURAL EXPERIMENT STATION

UNDER THE CONTROL OF THE

TRUSTEES OF THE A. & M. COLLEGE

GOVERNOR W. W. KITCHIN, *ex-officio* Chairman, Raleigh

C. W. GOLD.....	Raleigh	M. B. STICKLEY.....	Concord
E. M. KOONCE.....	Jacksonville	T. T. BALLINGER.....	Tryon
T. E. VANN.....	Como	N. B. BROUGHTON.....	Raleigh
D. A. TOMPKINS.....	Charlotte	O. L. CLARK.....	Clarkton
J. O. ELLINGTON.....	Fayetteville	EVERETT THOMPSON ..	Elizabeth City
W. E. DANIEL.....	Weldon	R. H. RICKS.....	Rocky Mount
W. H. RAGAN.....	High Point	O. MAX GARDNER.....	Shelby
W. B. COOPER.....	Wilmington	M. L. REED.....	Asheville

STATION STAFF

D. H. HILL, President of the College

C. B. WILLIAMS.....	Director and Agronomist
W. A. WITHERS.....	Chemist
F. L. STEVENS.....	Vegetable Pathologist and Bacteriologist
J. S. JEFFREY.....	Poultryman
J. P. PILLSBURY.....	Horticulturist
R. S. CURTIS.....	Animal Husbandman
G. A. ROBERTS.....	Veterinarian
R. I. SMITH.....	Entomologist
W. C. ETHERIDGE.....	Associate Agronomist
B. J. RAY.....	Assistant Chemist
A. R. RUSSELL.....	Assistant in Field Experiments
L. R. DETJEN.....	Assistant Horticulturist
GUY WEST WILSON.....	Assistant in Vegetable Pathology
T. B. STANSEL.....	Assistant Chemist
C. E. BELL.....	Assistant in Bacteriology
A. F. BOWEN.....	Bursar
LOULA V. SHERWOOD.....	Secretary and Stenographer

The Bulletins and Reports of this Station will be mailed free to any resident of the State upon request.

Visitors are at all times cordially invited to inspect the work of the Station, the office of which is in the new Agricultural Building of the College.

Address all communications to

N. C. AGRICULTURAL EXPERIMENT STATION,
WEST RALEIGH, N. C.

TABLE OF CONTENTS

	Page
Introduction.....	89
The Stock.....	89
Selecting a Variety.....	90
Poultry Houses.....	91
Feeds and Feeding.....	94
Grain Feeds.....	95
Green Feeds.....	96
Animal Feeds.....	98
Methods of Feeding.....	98
Cost of Egg Production.....	99
Hatching Chicks.....	100
Raising Chicks.....	102
Poultry Sanitation.....	104
The Farmers' Advantages.....	107
The Town Poultryman's Conditions.....	107

PROFITABLE POULTRY RAISING.

BY J. S. JEFFREY.

In many cases those keeping poultry do not know whether they do so at a profit or a loss. In some cases poultry is kept by people who admit that they could buy their poultry and eggs cheaper than they produce them.

For those keeping only a few fowls and wanting fresh eggs no matter what they cost this kind of poultry keeping may be all right.

The poultryman keeping poultry for a living must have a profit for his work or it is only a matter of time till he will be obliged to change his occupation.

The farmer who keeps poultry should know whether he gets returns enough from them to pay for the feed eaten and the time devoted to them.

Whether poultry raising can be made profitable depends on a good many different conditions, but perhaps more on the person doing the work than on any other factor. Under average conditions as to cost of feed and value of the product, a person who understands the needs of fowls should be able to care for them so that they will return a good profit.

The most common cause of failure in poultry raising is lack of knowledge on the part of the person undertaking the work, and there is perhaps no other line of work in which it is so common for people to venture expecting success without any knowledge of the business.

On the farm a small flock can be kept and do fairly well with very little attention and feed, simply because the hens can find so much of their own feed on the farm. The same flock kept in a small yard and cared for in the same way would be practically non-productive. Even the farm flocks in many cases do not give the returns they might. The farmer overlooks the fact that his hens can not find nearly as much of their feed during the winter as they can in summer, and fails to supply them with something to take the place of what is lacking at this season.

For the best results it is necessary to have good stock, comfortably housed and properly fed.

Stock.

In order to get the best results in poultry raising, or in fact, in any line of live stock work, it is necessary to have good stock to work with. This is as true of farm poultry kept for the production of eggs and meat as of the fancier's fowls raised largely for exhibition purposes. The only difference is that the fowls are measured by a different standard. No matter what the stock is kept for, it should be the best obtainable for the use to which it is to be put.

What we keep poultry for, what conditions we have to keep the flock under, or our personal likes and dislikes, may make some difference in

the variety we select, but there are some points which should be kept in mind no matter what variety is selected or what use is made of them.

No matter what variety is selected or what special branch of poultry keeping is engaged in, it is necessary to have strong, vigorous fowls if the best results are to be obtained. The weakling, no matter how good it may be in some other respect, should never have a place in the breeding pen.

In selecting a male to head the breeding pen, the first consideration should be vigor. He should be courageous, always willing to fight for and defend his mates, active and hustling, and should have a strong crow.

The hen should be active and busy, early off the roost in the morning, late in going to it at night, always on the move hunting for something to eat.

The variety or breed that is selected is not of great importance, but for certain conditions some are naturally better adapted than others. The farmer wants a fowl that is active enough to forage for a good part of its living. A large part of the profit which comes from farm poultry is made out of the waste products which the fowls find for themselves.

Fowls are naturally gleaners and scavengers, and while some may object to this latter term it is a fact that in many places they are kept to utilize waste products. On the farm under the best management this would consist of grass, grains wasted in the harvesting and insect life of different kinds found in the field. In other cases the hens forage in the stable, barn-yard, and manure shed. While there may be no objection to this latter for fowls whose eggs are used for hatching, it is not good practice if fine flavored eggs are wanted for marketing.

Many people, keeping a few fowls in a small lot, add greatly to the profit derived from them by utilizing the waste from the house. A large part of the ordinary kitchen waste can be used to good advantage for feeding fowls if it is kept in good condition and nothing put with it which would be injurious, such as tea leaves, coffee grounds or soapy water.

The farm fowls must still in a great many cases hatch and raise their own young, and this would eliminate the egg breeds such as Leghorns or Minorcas, which do not, as a rule, become broody. If, however, incubators are used and eggs are the principal product wanted, especially if there is a preference for white shelled eggs, these varieties will give good satisfaction.

For the average farm, where both eggs and market chickens are wanted, one of the general purpose breeds will probably give the best results. In this class we have the Plymouth Rocks, Wyandottes, Rhode Island Reds, and Orpingtons. Good stock of these varieties will be found to be good egg producers as well as making fine table poultry.

The town or small lot poultryman wants fowls that can be kept in small quarters and that stand confinement well. The Leghorns, being light, active birds, are hard to keep in small yards and high fences are necessary. On account of their active, nervous disposition they do not do as well under these conditions as where they have abundant range and the benefit derived from their good foraging qualities is lost.

Poultry Houses.

The question of poultry house construction is much simpler in our climate than it is in the North where the winters are much colder and where the fowls are confined to the house for long periods by the ground being covered with snow.

Under Southern conditions the house is very little used except at night and as a protection from storms and during very hot weather as a protection from the sun if other shade is not available.

The idea, which was prevalent a few years ago, that the house was to keep the fowls warm, has been very largely abandoned, and even in cold climates reports are being sent out showing that better results are obtained from fowls kept in cheaply constructed cold houses than from those kept in more expensive and warmer houses or in houses artificially heated during cold weather.

It must not be inferred from this that cold weather is ideal for egg-production; the better results in the colder houses not being due to their being colder, but because the other conditions are better, the house being dryer and having a better supply of fresh air.

There are a great many different kinds of poultry houses, many of which are quite satisfactory. No matter what kind or size house is built there are some conditions which should be observed if the best results are expected. Perhaps the most important of these is dryness. Fowls will not do well for any length of time in a house that is damp. Neither should they be confined on damp ground. Ground that is heavily shaded or so low that it is damp most of the time is much more difficult to keep free from disease germs than ground that is dryer. It is quite possible to have periods that are too dry for the best results either from the hens or chicks. During long, continued droughts, when green feed is scarce and dry, there is apt to be a scarcity of insect life, and unless special attention is given during such times there is very likely to be a falling off in egg production and the growth of the chicks will be checked. A range which provides both upland and low ground gives ideal conditions, as fowls will choose their own ground to suit the season.

Plenty of sunlight in the house is also necessary for best results, in fact it is not often that the house can be kept as dry as it should be unless the sunlight can get well through it. Sunlight is also a good germ destroyer, and the house should be arranged so that full advantage may be taken of this cheap means of disinfection.

Fresh air is also necessary, and the better results obtained from fowls in the colder houses previously referred to may be largely attributed to the better ventilation in these houses. It will be noted that all the houses illustrated are of the open-front type. The back and ends of these houses are made reasonably tight to prevent drafts striking the fowls, especially when they are on the roost.

The house should also be arranged so that it is convenient to work in and the appliances in the house should all be movable. Nests and roosts nailed to the wall make it difficult to fight mites and lice.

Fig. 1 shows a house which is giving good satisfaction at the Experiment Station. The back and ends are made tight and half the front is open. The opening is high enough to allow the sunlight to get well to the back of the house.

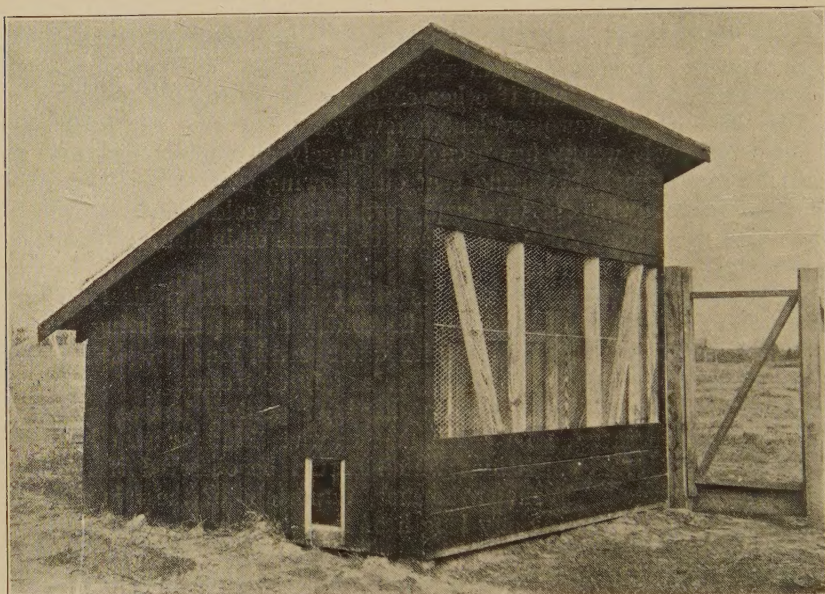


Fig. 1—Open Front Shed-Roof House.

Fig. 2 shows a double house of the same kind as the former. This can be used for two pens of fowls or for one larger flock. In either

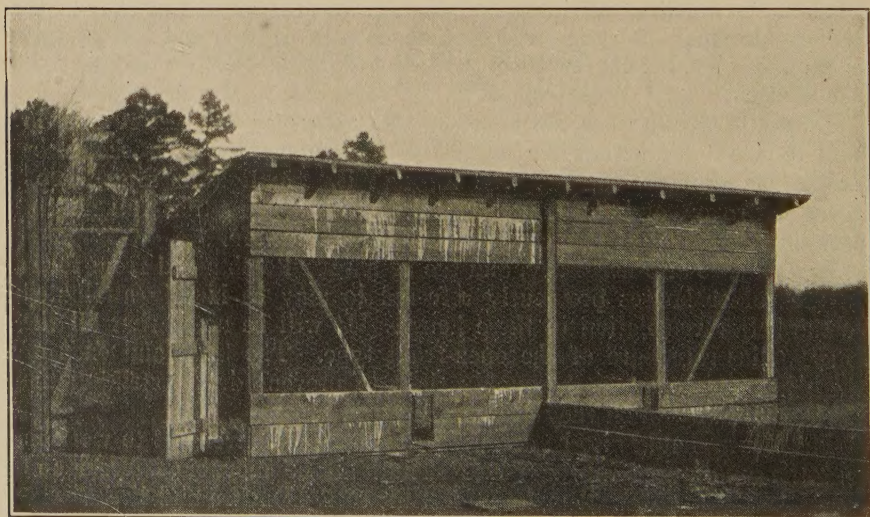


Fig. 2—Open Front Shed-Roof House for Two Pens of Fowls.

case the house should be divided by a partition in the center. If one large flock is kept in it the partition need not go all the way down to the floor, but may end just below the dropping board. The partition makes the house more comfortable by breaking winds which strike in at an angle with the front. Without the partition the wind will get to the back of the house on account of the long, open space, and part of the roosting room will be uncomfortable.

In Fig. 3 is shown a house that is quite popular in the North at present, and gives good results under their conditions.

For Southern conditions a higher front is better, as it admits more fresh air and sunlight through the house. The roof also is not as well adapted to our conditions as one giving less exposure to the south. The low front and long slope of roof to the south makes a very hot house in summer, and in our climate it is sometimes more difficult to keep the fowls comfortable in summer than in winter.

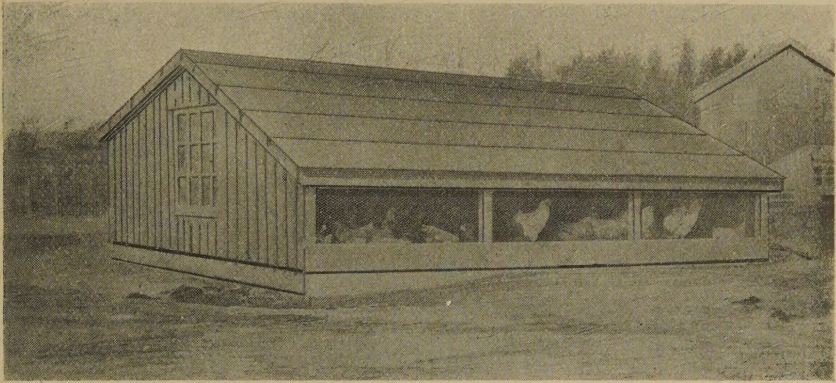


Fig. 3—Open Front House with Low Front. Photo by W. R. Graham.

In Fig. 4 is shown the same house as is shown in Fig. 1, with the top part of the back wall made as a door and opened for use during hot weather. This arrangement makes a much cooler house, but it has been found that at times the fowls do not like the draught in this house and roost under the dropping board to avoid it. A smaller opening near the top of the wall would probably give the necessary ventilation and avoid this objection.

A portable house is very useful on the farm. It can be used either for a pen of fowls or for a brooder house for chicks. It can easily be moved from place to place so that the fowls can have the benefit of fresh ground and good grazing.

The colony houses shown are made 10 feet by 10 feet, except the double house, which is 10 feet by 20 feet. The front posts are 8 feet high and the back ones 4 feet.

The portable house is usually made 6 feet by 8 feet and has a board floor. The floor makes the house stiffer, so that it stands being moved better than one without one, and also saves filling up the inside of the house with earth high enough to keep the floor dry.

In houses left in one place board floors are not recommended. A cement floor covered with sand or litter is the best, but on account of the expense is not often used.

A good floor can be made by raising the house high enough off the ground to give good drainage. Fill the house with a layer of stones and cover these with light loam or sand thick enough so that the floor is soft and the sand deep enough for the hens to dust in. The ground around the house should be graded to give a slope from the house in all directions.

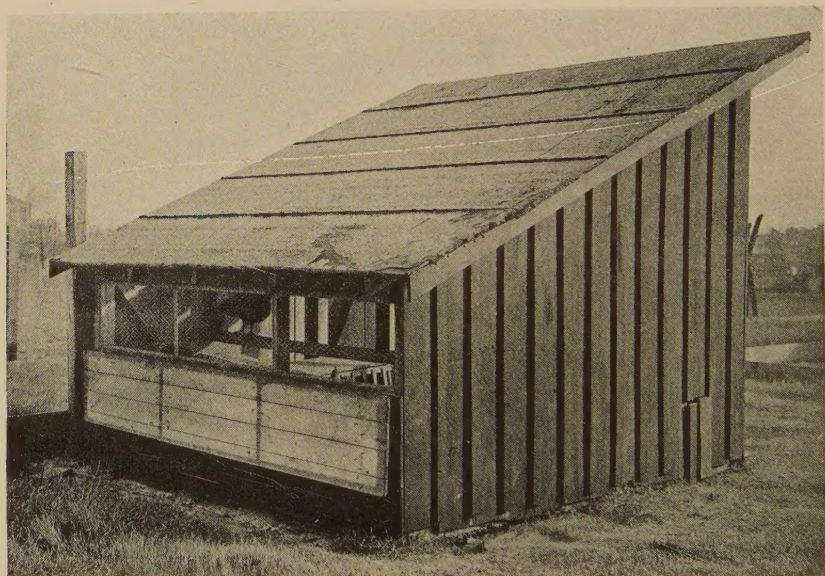


Fig. 4—Rear View of House in Fig. 1. Showing Upper Half of Back Open in Hot Weather.

A floor of this kind can be kept in good condition by removing the sand a couple of inches deep each summer and replacing with fresh sand.

In an open front house the roosts should be at the back of the house so that the fowls will be as far away from the opening as possible. If a dropping-board is used it should be just high enough to allow the nests to be placed underneath it.

Fig. 5 shows the roosts hung on stop-lice hangers. When these are used the roosts are cut short enough so as not to touch the walls at either end. Holes are bored part way through the roost near each end, into which the hangers fit. There are small cups on the hangers, which can be filled with kerosene, breaking the connection between the wall and the roost.

Feeds and Feeding.

The feeding of poultry does not differ very much from that of other animals. They need the same food nutrients and, with the exception of the mineral or ash portion, in about the same ratio as is required for the dairy cow.

Small animals, which double their birth weight quickly, need proportionately more mineral matter than do the larger ones in which the relative gain is smaller. In the mammals nature has provided for this by increasing the amount of this element in the milk of the mother. While we have no data with regard to chickens as to just what percentage of ash should be in the ration, experiments have shown that rations containing a liberal amount of ash give better results both in development of the stock and in the production of eggs.

Poultry feeds may be divided into three classes, viz: grains and their products, green feeds and animal feeds.

In most cases the grains and their products form the larger part of the feed eaten by the hens, but occasionally we find on the farm at

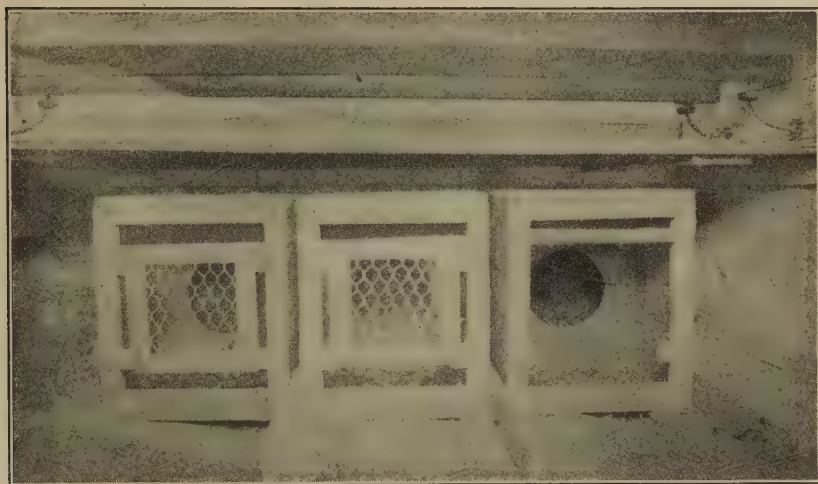


Fig. 5—Roosts Hung on Stop-Mite Roost Hangers.

certain seasons the hens getting practically all of their feed from the latter two classes, green feed and insects found in the fields forming the bulk of the ration.

The grains most commonly used for feeding poultry, in this section at any rate, are corn, wheat, and oats, and of these corn is more largely used than the other two together.

Notwithstanding the fact that the chemist tells us that corn does not contain nutrients in the proper ratio to make it a satisfactory feed for fowls by itself, it is found to be the principal feed used for poultry in many places where poultry is largely raised. This is especially true of farm poultry.

Corn, on account of its carbonaceous nature, is a better feed during cold than warm weather.

Some poultrymen, especially those feeding farm flocks, think this is not correct, because they find that where corn is the only feed given the hens they get eggs more plentifully during the summer. They overlook the fact that during the winter the hens are dependent on the feeder

for almost their entire ration, while during the summer they can find a large part of it in the fields, and that what they get there is just what is needed to supplement and balance the corn ration.

Wheat is generally considered the best single grain for poultry. It is well liked by fowls and is not heating in its nature.

The price of good milling wheat is very often too high to permit of its being used for poultry feed. Good wheat screenings or wheat slightly damaged may often be had at a reduced price and can be used in place of the higher priced grain.

Oats are perhaps the best grain for feeding poultry, especially for the growing chicks. They are richer in protein and ash than either corn or wheat. On account of the large amount of husk they are not as palatable to the fowls as either corn or wheat and fowls that have not been accustomed to them do not eat them freely at first.

Crushed or ground and fed in a mash they are eaten freely. In some places they are the only feed given for the dry mash and good results are reported from their use.

The grain products most commonly used are corn meal, wheat bran, wheat middlings or ship-stuff and ground oats.

Green feeds are important, and if best results are expected they are a necessary part of the ration. On the average farm where only a few hens are kept it is not necessary to make any special provision for supplying this part of the ration during the summer, as the hens will find all they need if given free range. Fowls in confinement during summer and all fowls during the winter will benefit from a plentiful supply of green feed in some form which they relish.

On the farm the winter hay crops, such as oats, wheat or clover, will supply the needs in this direction.

Fowls can be pastured on these crops with no appreciable damage to the crop if care is taken to prevent their getting on it too early and it is not too heavily pastured.

In some of the lots at the Experiment Station these crops are used and twenty hens per acre pastured on them from the time they are well started till they are cut for hay with practically no loss to the crop except just around the house.

To utilize these crops the portable house previously mentioned is especially adapted, as it can be moved from place to place to suit the crops. For fowls kept in confinement, these same crops may be used if the yards are large enough so that the crop will not be killed out too quickly. A pen of ten hens and a male bird have been kept plentifully supplied with green feed from November to May on oats or rye in a lot eighteen feet by one hundred and sixty-five feet. The amount of space necessary will depend on the fertility of the soil and to a large extent on the season. It is always better to have the lot large if the necessary land is available.

If the fowls must be confined in small yards green feed may be supplied by giving cabbage, turnips or other vegetables. If only a few hens are kept there may be enough waste of this kind from the house or in many places vegetables which are unsuitable for household use may be procured at a low cost.

Where green feed is needed in larger quantities oats may be sprouted without much labor and at a low cost and make feed which is relished by the fowls.

In Fig. 6 is shown an oat sprouter in use at the Experiment Station. The drawers or flats are thirty inches square and two inches deep. The bottoms are made of galvanized iron, which is perforated to allow for drainage. Ten quarts of oats fill one of these drawers about one inch deep, and when sprouted till about three or four inches high will feed



Fig. 6—Oat Sprouter Used at Experiment Station.

six hundred to eight hundred hens. With oats at sixty cents per bushel this would cost fifteen cents per day for the number of hens mentioned, which is perhaps as cheap as any form of green feed that can be supplied except on the farm where the fowls are scattered over a considerable area and do not injure the growing crop.

Animal Feeds.

Animal feeds are used principally for the protein and ash which they supply. Protein may also be supplied from a vegetable source. Cotton-seed meal and linseed meal are the most commonly used feeds of this class and are largely used in feeding cattle, but they are not as well suited to poultry feeding as the animal feeds. They are not as well liked by the fowls and do not contain as much ash as is commonly found in the animal feeds used for poultry feeding.

Commercial beef scrap is perhaps more commonly used for poultry feeding than any other animal product. Good brands of this contain about 55 per cent protein, 12 per cent fat and 15 per cent ash.

Meat meal varies in composition and value, some commercial forms containing 60 per cent protein, while others may run as high as 85 per cent. The ash content is usually much lower in this product than in beef scrap.

Raw bone should contain about 25 per cent protein, and 22 per cent phosphoric acid. This is used in the form of meal and granulated bone, the former in the mash and the latter in a hopper for the fowls to eat as they wish. Meat meals that are deficient in ash can be improved by the addition of raw bone meal.

Green cut bone is used to advantage where a supply of it can be secured regularly without too much expense in getting and preparing it for the fowls.

On account of its nature it spoils quickly in warm weather, especially after being cut. This necessitates the getting of it frequently, and unless this can be combined with other business the expense of a special trip for the bone alone makes its cost high.

A mill is also necessary in preparing it for the fowls. For a small flock this adds considerable to the cost of equipment. For a large flock the labor in preparing it is considerable unless power is available.

The dairyman who is delivering regularly and who has power for his dairy work is in the best position to make use of this feed. Skim milk and butter milk can also be used to advantage in feeding poultry. They are equally good for the growing chicks and laying hens.

It has been demonstrated that for summer feeding at any rate skim milk is one of the very best feeds that we have for egg production.

Methods of Feeding.

The best method of feeding will vary with conditions. What might be the most economical plan for a man keeping only a few fowls on a town lot might be altogether out of the question for a farmer keeping one hundred or more hens on the farm.

It has been found that hens do better when fed a ration consisting of grains and of a mash made of ground grains and their by-products, and at times some animal food.

Formerly the common practice was to feed mash once a day and grain once or twice according to the conditions. In this way the mash was moistened with water or milk and fed in troughs, giving as much as the hens would eat clean in a short time. The objection to this plan is the labor involved. The mixing of the wet mash required consid-

erable time each day in preparation and in feeding. If the feeder were not experienced the fowls would be apt to get too much; in which case the portion left over would have to be gathered up or be wasted. If too little were fed the egg yield would suffer.

Of late years many have adopted hopper feeding, in some cases the mash only being fed in this way and in others the entire ration.

The feeding from hoppers reduces the labor of feeding and thus allows the keeping of more poultry than could be looked after under the wet mash system of feeding.

The plan in use on many farms of feeding the hens grain once or twice a day will not give the best results, especially where the bulk of the grain fed is corn. Under this treatment we find eggs scarce in winter and plentiful during spring and summer, when they are low priced.

The supplying of a mash containing some animal food would in most cases greatly increase the egg yield and would give the increase at a time when eggs bring the highest price.

In the work of the Station we have tried to keep the rations as simple as possible and at the same time work out a system of feeding that would give good results without too much expense for labor.

The system that has been used with good results for the last year or two is as follows: Feed the fowls on a dry mash from a feed box or hopper which is open at all times. The grain is fed once a day and during the winter is scattered in litter for the hens to scratch out. During the hot weather the litter is removed from the pens and grain fed on the ground.

The grain is fed late in the afternoon at the time the eggs are gathered. Feeding at this time saves an extra trip which would be necessary if the feeding were done at another time. By delaying the feeding of grain till evening, the hens also eat more mash than they would if fed grain earlier in the day or if it were fed twice a day. It was found that the hens that only ate a small amount of mash did not do as well as those that ate approximately fifty per cent of the total ration as mash.

When there is extra good range for the stock it may be possible to get good results by feeding the entire ration from hoppers, but in most cases the hand-feeding of the grain will give more satisfactory results and if done as suggested above there will be very little extra time needed.

The feeding for egg-production might properly be considered under two heads, the production of eggs for market and of eggs for hatching. Rations which are quite satisfactory for the former are sometimes quite unsatisfactory when eggs are wanted to produce a good percentage of strong, vigorous chicks. It is generally thought that rations containing considerable animal food, while quite satisfactory as to the number of eggs produced, do not give the best results for breeding purposes.

Results obtained at this Station and published in Bulletin No. 211 show that skim milk fed in combination with corn and wheat and a mash of equal parts of corn meal and wheat bran, gave the best returns in egg production, but were closely followed by a ration in which meat meal and bone meal were fed in the mash in place of skim milk. A

ration composed wholly of corn and corn meal with all the skim milk the fowls would drink also gave good results.

For the past year or two a portion of the Station stock has been fed on grain which was not marketable. The corn used was that shattered in the husking and shredding. The wheat was screenings. The corn was bought of the Station Farm at thirty-five cents per bushel, which was just half the price of good corn at the time. The wheat screenings were bought from mills in the neighborhood at a cost of \$1.50 per 100 pounds.

Two parts of corn and one part of wheat constitute the grain ration and the fowls were given all they would scratch for each evening. The mash was made of 4 parts corn meal, 4 parts wheat bran, 2 parts meat meal and 2 parts bone meal. The mash was fed from feed boxes which were open to the hens at all times.

One pen each of Barred Plymouth Rocks and of S. C. Rhode Island Reds were fed this ration. At the beginning of the experiment there were ten hens and a male in each pen. One Plymouth Rock hen died and two hens and the male were disposed of from the Rhode Island Reds about June 1. The eggs laid, food eaten, cost per dozen of eggs, and profit per hen for the six months are shown in the accompanying table. Eggs are figured at two cents each, which is a fair average in the local market.

Breed	Eggs Laid	Food Eaten		Cost of Food	Cost of Eggs Per Doz.—Cents	Profit Per Hen
		Grain	Mash			
Barred Plymouth Rocks...	833	243	243	\$6.28	9.00	\$1.038
Rhode Island Reds.....	833	232	224	5.87	8.45	1.079

The ration fed is the same as gave best results during the winter period as reported in Bulletin No. 211, except that the grains in this case were lower priced, as noted.

It will be observed that the grain and mash were eaten in about the same amounts. This bears out the results obtained previously where hens eating a liberal amount of mash did better than those that ate considerably more grain than mash.

Hatching Chicks.

On the farms of the State most of the chicks are still hatched by hens, and where only a few chicks are wanted this method will be found as satisfactory as any. Most people will raise better chicks with hens than by artificial means simply because they divide the responsibility with the hen. Experienced poultrymen do very well with the incubator, but chicks hatched in this way need constant care and attention.

For hatching for the early market and for large quantities of chicks for any purpose, the incubator is practically a necessity. For hatching the breeding stock the hen is preferred. If hens are to be set, a

separate place should be provided where they will not be disturbed by the other hens.

Those that become broody and are to be set should be moved at night and handled carefully or many of them will refuse to keep the nest after moving.

If several hens are to be set at the same time the nests should be so arranged that the hens can be confined to them. A nest open to the front is preferred to one open on top, as there is less danger of the eggs being broken where the hen walks into the nest from the level of the floor than where she is obliged to get up on the top of the nest and then jump down on to the eggs.

When the nests are arranged and the hens become broody they are moved quietly after dark to the nests. A nest egg is given each and they are covered loosely with sacks to keep the nests rather dark. About noon the next day feed and water are supplied and all the hens are removed from the nests. They are allowed to do as they please for an hour or two, and those that go back are given the eggs they are to hatch. Those which do not return of their own accord are removed from the pen and broken up as soon as possible.

Those hens that are to be set are given a thorough dusting with insect powder and some is also sprinkled about the nest.

In our work pyrethrum powder has been found the most satisfactory. It costs more than most of the powders put up specially for the poultry use, but is more effective and there is less danger to the hen and chicks from its use. A second dusting should be given about the sixth or seventh day and a third on the eighteenth day. Do not leave the last dusting till the eggs are chipping or the hatch is apt to be injured by disturbing the hen and also by the insect powder injuring the chicks as they break the shell.

It may seem to some that three dustings require a lot of work and are unnecessary, but experience has shown that the time and powder used in this way pay good dividends in more and better chicks.

If the nest is to be used a second time it should be thoroughly cleaned out and the nesting material burned. The nest box should be thoroughly gone over with some good insecticide. A five per cent solution of one of the coal-tar disinfectants or ten per cent kerosene emulsion will give the desired result if thoroughly applied. Care should be taken to see that every part of the box is well soaked, both inside and outside, special attention being given to the cracks and corners.

If a number of hens are set at the same time, the eggs should be tested for fertility at the end of the first week and the infertile ones removed. If there are many infertile, those that are good may be given to some of the hens and the balance given a new lot of eggs.

Do not bother the hen at hatching time. The chicks are better left alone with the hen till they are twenty-four hours old.

It is difficult to give rules for operating incubators that will give good results with all makes. Differences in construction make necessary different methods of operation, and the place where the thermometer is kept will determine the degree of heat which it must regis-

ter in order to get the best hatch. In most cases it is best to follow closely the directions for operating sent with the machine.

Some manufacturers recommend the use of moisture in their machines, while others make an advertising point of the claim that their machines do not need any.

It has been found in the work at the Experiment Station that under average weather conditions the use of a moisture pan helps the hatch in the so-called non-moisture machines as well as in those in which the makers recommend its use.

In most incubators, the moisture is supplied by a pan in the bottom in which wet sand is kept. Machines which ventilate through the side walls generally have the pan the full size of the bottom of the incubator. With machines that ventilate through the bottom this plan has to be modified somewhat in order not to interfere with the ventilation.

The pan should be made from three to six inches smaller each way, according to the size of the incubator, than the inside measure of the nursery. Place two one-inch square pieces from front to back on the bottom and place the pan on these. The pan need not be over one inch deep and should be from one-half to three-quarters full of sand, which should be kept wet. The pan should be put in when the hatch is started and taken out on the eighteenth day.

Thorough disinfection of the incubator just before the eggs are put in is recommended. Zenoleum and Chloro-Naphtholeum have both been used with good results. For this work a strong solution is used, it usually being ten per cent.

The egg tray is washed first, then filled with eggs ready for the hatch. The inside of the incubator is then thoroughly washed, the eggs put in and the door closed. The machine is always heated and regulated for the hatch before the disinfection.

Raising Chicks.

The chicks, whether hatched by the hen or in an incubator, need warmth and quiet the first day or two more than they do feed. Nature provides the yolk of the egg to feed the chick till it gets strong enough to hunt its own food, as it is obliged to do under natural conditions.

When the chicks are ready to move to the coop, it will be a good plan to give them a dusting with insect powder to make sure that they get a fair start. A good way to do this will be to use a shallow box for carrying the chicks and to sprinkle them liberally with the powder in the box. The surplus powder can be taken up and used for another lot. The hen also should be dusted at this time, as it is time wasted dusting the chicks if the hen is not free from lice.

A good coop for the use of the hen and chicks is the A-shaped coop shown in Fig. 7. This coop is easily made and affords good protection against the weather. The slats on the front should be wide enough apart so that the chicks can run in and out freely while the hen is confined to the coop. It will be good practice to keep the hen confined for the first two weeks instead of allowing her to run at large and carry her chicks wherever she likes. The chicks will grow faster and fewer will be lost if they do not range too far at first. These coops may be

used either with or without a floor. In the early part of the hatching season when the ground is apt to be cold and damp, a floor is an advantage. Later on this may be dispensed with.

Make the floor separate from the coop, as it will be much easier to clean if this is done. Make the floor slightly larger than the bottom of the coop. When cleaning lift the coop off the floor, which can then be thoroughly cleaned and the coop replaced.



Fig. 7—A Shaped Coop for Hen with Chicks.

If no floor is used the simplest way to provide clean ground for the hen is to move the coop to a new place frequently. Water should be provided as soon as the chicks are put in the coop and a light feed may also be given.

The feeding of the chicks varies greatly in different localities and with different feeders. It is doubtful if any plan can be given which will give best results in all cases. The following has given good satisfaction at the Station plant: For the first three days, the chicks are fed rolled oats and hard boiled eggs in the proportion of four parts oats to one of eggs. The eggs used are those tested out as infertile. These

are hard boiled and put through a meat chopper, shell and all, and are then thoroughly mixed with the oat flakes. If bread crumbs can be obtained they may be substituted for the oats. From the fourth to the fourteenth day, corn bread or johnny cake is substituted for the oat flakes. This is made of equal parts of corn meal and wheat middlings, and if possible mixed with milk instead of water.

The eggs may either be broken and baked in the bread or fed hard boiled. If baked in the bread one dozen (one and one-half pounds) should be used with three pounds each of corn meal and middlings.

Finely cracked chick feed is also given at this time. During this period the chicks are fed five times a day, three feeds of the grain ration and two of the bread and egg mixture, the first and last feeds for the day being of grain.

When the chicks are two weeks old a dry mash, the same as is used for the adult stock, is added and the bread and the eggs are gradually done away with.

The grain feed may be one of the commercial chick feeds or a home-made mixture. That fed at the Station is a home-made mixture consisting of two parts small wheat and one part each of finely cracked corn and the coarsest grade of steel-cut oats. The wheat is the smaller grains from the wheat screenings separated by passing it over a screen of one-eighth inch mesh. The corn is the coarsest part of home-ground corn meal. The oats were purchased from manufacturers of oatmeal. By the time the chicks are two or three weeks old, hulled oats are substituted, as they are cheaper and not too large for chicks of this age.

When the chicks are four to six weeks old they can be sorted and their feed from that time on will depend on the use that is to be made of them. Those to be kept for breeding stock should be given plenty of range and be fed to produce good growth. For this purpose use a mixture of equal parts of corn and wheat with a dry mash made up of four parts corn meal, four parts wheat bran, two parts meat meal and two parts bone meal. If good range is provided the meal may be omitted.

During hot, dry spells in summer, it is sometimes an advantage to give a feed of wet or moistened mash in addition to the above. This makes extra work, but the returns in growth and development will more than offset the cost of the extra effort.

If they are to be marketed as fryers or broilers, they should have less range and a more fattening ration. The object here being to put them in market condition just as quickly as possible.

In sorting the stock at this time, the farmer very often makes a very serious mistake in taking the largest and best developed chickens for market and keeping the smaller and poorer chickens for his own use. This may bring better money returns for the time being, but a few generations of this practice will bring the whole flock to the level of the culls.

Poultry Sanitation.

There is perhaps no branch of poultry work about which more questions are asked or information is more wanted than diseases. There is also no branch of work that it is better for the poultryman to keep away from than doctoring sick fowls.

Poultrymen throughout the country suffer heavy losses from disease at times not so much because they do not know how to cure disease as because they do not understand the principles of sanitation and the importance of preventive rather than of curative measures.

The treatment of diseases in poultry is unprofitable for two reasons: first, because if the attendant's time is worth much it usually costs more to effect a cure than the fowl is worth; and, secondly, because each fowl cured is usually returned to the flock and soon lost track of, and may produce offspring which are very apt to inherit the weakness which made the parent more subject to disease than were others in the flock.

The importance of sanitation has increased with the growth of the poultry industry, and further increases in the number of fowls kept will only intensify the importance of this subject.

Poultry sanitation may be considered under two general heads:

Houses.

In a previous chapter dealing with the housing of the fowls suggestions were made as to the kind of house most likely to be satisfactory, and attention was called to the necessity for fresh air and sunshine. The importance of cleanliness was also pointed out. There is, however, often a great difference between an ordinarily clean house and one that is clean from a bacteriological standpoint. This latter means not only ordinary cleaning but thorough disinfecting at least once a year.

Before disinfecting a poultry house it is important that it be cleaned thoroughly, removing all droppings, dust, cobwebs, and any litter that may be on the floor. If an earth floor is used enough of it should be removed until none of the litter shows in it. It is only after a thorough cleaning of this sort that disinfecting can be done to best advantage. In most Southern localities, at least, it is good practice to give a first spraying of kerosene emulsion. This emulsion is made as follows: Cut up and dissolve in one gallon of hot water one pound of hard soap or one and one-half pounds of soft soap. While hot stir in two gallons of kerosene and continue stirring till thoroughly emulsified and cool, usually 15 to 20 minutes. When ready to use add 17 gallons more of water. This makes a ten per cent emulsion, which will kill all the mites and their eggs that it comes in contact with. The emulsion may be applied either with a spray pump or whitewash brush, the former being preferable. Allow the house to dry thoroughly and spray with a three per cent solution of one of the coal tar disinfectants, such as Chloro-Naphtholeum or Zenoleum. When the house is dry again follow this with whitewash in which the same amount of the disinfectant is used. Particular attention should be paid to the nests, to the roost boards and to any places that are difficult to get at. The principal thing is to use a good disinfectant and plenty of it.

These same instructions will apply to the brooder house, the individual brooders and to the incubator, the only difference being that the brooder and incubator need more frequent disinfecting. Once a week is not too often to disinfect the brooder, especially if there are any symptoms of disease among the chicks.

The incubator should be thoroughly disinfected just before each hatch is started.

Soil.

While the house has been mentioned first, the ground is perhaps more often to blame for troubles, both with the chicks and with adult fowls. In fact, it is being recognized more and more that the condition of the soil can very largely make or mar success in poultry raising.

Failure to realize this and that soil originally in good condition for poultry raising may by misuse and neglect get into such a condition that profitable poultry raising on it is impossible is responsible for many of the failures that we have with poultry. While this condition becomes apparent more quickly and is more often found among flocks kept on limited quarters, such as a town lot, it is not by any means unknown among farm flocks.

Many people who make a success on the start with a few fowls very quickly get into trouble for which the ground is responsible when they increase their flock and do not take precautions to prevent the ground from being tainted from the droppings. Poultry benefits by crop rotation just as much as any other farm crop if it is made a feature in the rotation. The best way to keep the ground in good condition for poultry is to grow crops on it as well as poultry. If the land has already become unfit for raising poultry on, it will be best to give up this line of business for a time. The free use of lime and the growing of crops, with the necessary turning of the ground, are the best ways to freshen the ground and get it back into such a condition that it will be profitable to grow chickens on.

Chickens grown on ground which has become tainted generally have an unthrifty, sickly appearance, and in this condition are much more subject to disease. Chicks raised on the same ground for a number of years without precautions being taken to freshen it are usually more or less subject to gapes and roup, and in fact to any disease to which fowls are subject.

Another point which may very well be mentioned here is in regard to the disposal of dead animals, whether fowls or larger animals.

One of the most destructive diseases which we have in the South among poultry is limber neck. This trouble is attributed to the fowls eating decaying animal matter. Far greater losses have been reported to the Station this year due to this disease than to any other.

The most common source of the disease is a chicken that has gotten out of sight and died. The other chickens eat the carcass and the maggots which soon follow death. Care should be taken to see that any animals which die are removed and either burned or deeply buried.

A law of the State requires that all dead animals be buried or disposed of in such a way that they are not a menace to the health of the community. It also places a penalty on the killing of the buzzard. The Southerner has become accustomed to looking on the buzzard as a scavenger and to depending on him to do this work, and consequently the first mentioned law is very seldom complied with, while the second is fairly well kept.

The natural food of the buzzard is dead animals, and if deprived of this, he is driven to preying on live ones and has under these conditions

been known to become a serious menace to poultry. There is no more active agency for the spread of some of our worst poultry diseases than the buzzard, and the sooner we become our own scavengers the sooner we will be free from this source of infection.

Farmers' Advantages.

The great bulk of the poultry raised throughout the country is raised on farms where it is only a small part of the investment. Poultry raising, however, under proper conditions, is one of the most profitable of the small industries. Statistics gathered in one county of New York State showed that for the money invested poultry was more profitable even than the dairy cow.

The farmer has a great advantage over the town poultryman in having abundant range for his stock where it should be able to get plenty of green feed and insects. Many farmers do not get as much advantage as they should from their conditions on account of a fear that the fowls will injure the growing crop.

Unless portable houses are used so that the fowls can be moved to suit the crops and conditions, it will be advisable generally to have a yard in which the flock may be confined when necessary. If portable houses are used yards will not be necessary. Fowls ranging on a grain crop just coming up will kill out a great deal of it, while if kept off for a month or two till the young plants get a good start they will not injure the crop if precautions are taken to prevent large numbers ranging on a small area.

Twenty hens to the acre may be pastured on a wheat or oat crop with no apparent injury to the crop if they are spread out in small colonies.

If two hundred were housed in one house with a range over a ten-acre field they would cause much greater loss.

The scattering of the flock in small colonies increases somewhat the labor of caring for them. The hopper method of feeding, mentioned above, is almost a necessity if the flock is kept in this way.

The greatest objection to this method is the difficulty of controlling any disease which may break out. In cases of this kind it is often necessary to confine the flock in yards for a time.

The farmer often suffers loss with his chicks because he has fallen into the habit of raising them year after year in the same place without taking any precautions to purify the ground between seasons. If only one place is available this may be kept in fairly good condition by the use of lime and by plowing and cropping between seasons. Even when cared for in the best possible manner, it is not as desirable as new ground or ground that has been used a season or two for growing crops.

Town Poultryman's Conditions.

The conditions and problems of the poultryman living in the city are somewhat different from those on the farm. In the city the poultryman is confined in most cases to comparatively small quarters and does not have the same chance to move his poultry to fresh ground that the farmer has. Under these conditions it is even more necessary to keep what

land one has in good condition. If a garden is also wanted the land available might be divided into two lots, placing the house so that the fowls may be turned into either lot at will. This will give a chance to alternate the ground between the garden and the garden and the poultry, which will be of advantage to both.

The man living in town does not have the advantage of range for his fowls, but as he usually keeps only a small number the waste from the kitchen can be made to help out with the feeding. In many cases these waste products are warmed regularly for the poultry and mixed with corn meal and wheat bran. Where the flock is small this does not entail enough labor to make it unprofitable as might be the case if conducted on a larger scale.

In many cases the town man succeeding with a small flock makes the mistake of increasing his flock beyond the capacity of his yards. With the larger flock the kitchen waste forms such a small part of the feed as to be hardly noticeable and he finds that his larger flock is not nearly so profitable as was the smaller one.

It is quite common to find persons starting in a new place making a marked success at first and gradually doing poorer and poorer till complete failure is reached simply because the yards have been overstocked and not kept in a sanitary condition.